PATENT ABSTRACTS OF JAPAN

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(54) METHOD FOR IMPREGNATION OF WOODY MATERIAL WITH CHEMICAL FLUIDS AND WOODY MATERIAL MANUFACTURED BY THE METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To impregnate a woody material with a greater amount of chemical fluids or the like uniformly to an inside without changing a size of the woody material within a short treating time by a method wherein after execution of heated steam treatment on the woody material, the woody material is impregnated with the chemical fluids.

SOLUTION: A woody material is contained as a material to be treated in a hermetically sealed space, a moisture contained in the woody material itself is made high pressure steam by heating, or high pressure steam is supplied from an outside, or by both of them, the woody material is allowed to stand in a heated steam atmosphere formed in the hermetically sealed space for a specific time. As impregnation of medical fluids to be executed thereafter, an immersion impregnation, a warm and cold bath impregnation method, a reduced pressure impregnation method, a pressure impregnation method, or an impregnation method by combination thereof, etc., are used. Thereby, an impregnation speed of the chemical fluids or the like is increased, impregnation treating time can be shortened. Even substance in chemical fluids of a large molecular weight can pass through a wall hole of the woody material or the peripheral part, a width of selection of the chemical fluids is widened, a great amount of impregnation can be executed, and drying of the material to be treated can be efficiently carried out

in a short time.

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CLAIMS

[Claim(s)]

[Claim 1] The drug solution sinking-in approach to the woody material characterized by sinking into this woody material in drug solutions after performing heating steam treatment to woody material.

[Claim 2] The drug solution sinking-in approach to the woody material characterized by to sink in in drug solutions to the woody material which held woody material in the sealed space, and heated woody material, and/or formed into the high-pressure steam the moisture which the woody material itself which supplied and held the high-pressure steam from the outside has, performed heating steam treatment to the woody material concerned, and performed this heating steam treatment.

[Claim 3] The drug solution sinking-in approach to the woody material according to claim 2 characterized by using the woody material which performed stoving processing beforehand and was made into water content lower than the water content by the natural condition as woody material held in the sealed space.

[Claim 4] The drug solution sinking-in approach to the woody material according to claim 2 or 3 characterized by supplying a high-pressure steam from the outside and performing heating steam treatment to the woody material concerned after making the inside of the sealed space into a reduced pressure condition.

[Claim 5] There is no claim 1 characterized by the sinking-in approach of drug solutions being the immersion sinking-in method, the hot-cold bath sinking-in method, the reduced pressure sinking-in method, the pressurization sinking-in method, or the sinking-in approach by those combination, and it is the drug solution sinking-in approach to the woody material of a publication 4 either.

[Claim 6] There is no claim 1 characterized by the temperature of this woody material sinking in in the drug solutions by the immersion-under ordinary pressure sinking-in method in the condition 60 degrees C or more after performing heating steam treatment to woody material, and it is the drug solution sinking-in approach to the woody material of a publication 4 either.

[Claim 7] Claim 1 thru/or drug solution sinking-in wood quality material manufactured by the approach of a publication 6 either.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the woody material manufactured by the drug solution sinking-in approach and this approach at the time of infiltrating drug solutions into woody material for the purpose like the improvement in a mechanical strength, or fire retardancy and antiseptic grant which were improved.
[0002]
[Description of the Prior Art] Infiltrating the drug solutions like an unsaturated-polyester-resin solution or a colloidal silica solution from improvement in a mechanical strength or the purpose of fire retardancy and antiseptic grant is performed to woody processing ingredients (henceforth [these are named generically and] "woody material"), such as a veneer, a plate sawed up from a natural tree like pure material, or a plywood.
[0003] The immersion sinking-in method sinking in is immersed into a drug solution and usually infiltrates processed wood quality material, The hot-cold bath sinking-in method for having been made to carry out absorption sinking in of the drug solutions into this woody material by moving quickly into a cold drug solution (cold bath), and making it cool, after heating processed wood quality material in a warm drug solution (hot bath), The air in the wood used as the hindrance of sinking in is eliminated with reduced pressure, and it is carried out by the reduced pressure sinking-in method which made it easy to carry out to sink [of drug solutions] in, the pressurization sinking-in method for pushing in drug solutions compulsorily with external pressure, the pouring-in method which combined the above mentioned reduced pressure and pressurization further. Thus, as compared with woody material with the woody unsettled material into which drug solutions were poured into and it sank, improvement in a mechanical strength and an improvement of physical properties like fire retardancy and antiseptic one are brought about.
[0004]
[Problem(s) to be Solved by the Invention] When carrying out sinking-in processing of the drug solution etc. to woody material, a drug solution etc. is fundamentally wanted to permeate the interior of woody material uniformly and so much in short time amount. however -- actual sinking-in processing -- the any -- although -- it is hard to say that it is attained as expected. In fact, even when it is water with comparatively easy osmosis into woody material, most time amount is required for permeating homogeneity even inside processed wood and reaching equilibrium. It is thought that the reason is difficult to permeate and becomes what has inadequate sinking in since the opening section inside wood is filled with air and a permutation with water is not usually performed easily. Water compares with the case of drug solutions, such as a resin solution, and osmosis becomes much more difficult the magnitude of the molecular weight, and for viscosity.
[0005] The drug solution which molecular weight uses using the high drug solution of permeability with viscosity low low again etc. in order to conquer these permeability is restricted, or as described above, using the reduced pressure sinking-in method, the pressurization sinking-in method, or the sinking-in method that reduced pressure and pressurization combined is performed. Depending on the case, long duration is required very much, and it is performing immersion sinking [of a drug solution] in. However, the present condition is being unable to obtain a desired sinking-in result, and effective processing by the short processing time is desired especially.
[0006] Moreover, cinclides are connecting between cells within woody material, and cinclides are usually blockaded by torus with the air dried material (about 12 - 14% of water content). Since the magnitude of the drug solution which can pass cinclides also in the condition of being open is restricted by spacing of the microfibril which forms MARUGO, even if it is going to sink in compulsorily by the above compulsory impregnation approaches, the drug solution more than the magnitude of cinclides cannot be passed. Therefore, the class of drug solution cannot but receive a limit.
[0007] since the swelling caused by sinking-in processing therefore happens to the condition of sinking in, or the condition of woody material at an ununiformity even if it is able to sink in well, or it cannot come out as it is, and it cannot treat as a final product but it saws up after sinking in after all -- polish and canna -- a finishing process like a cliff is needed. Moreover, generally, although near a cross section of wood shows good permeability, osmosis becomes difficult as it separates from a cross section of wood. Therefore, when sinking-in processing of a

drug solution is made, it is not avoided that near a cross section of wood swells.
[0008] Especially, to an ingredient like PB (particle board), MDF (medium-density fiberboard), and OSB (Oriented Strand Board) by which compression molding was carried out, it expands greatly in the thickness direction at the time of drug solution sinking in, and does not return to the original thickness after desiccation.
[0009] Furthermore, in order to make a drug solution component fix within wood after sinking in, it is necessary to carry out desiccation processing, but also in the desiccation process, since it is hard to escape from moisture or a solvent, long time amount is needed for the process which stiffens the process which volatilizes a solvent, resin, etc. If it is going to carry out for a short time, moisture gradient will become large and curvature, a crack, etc. will arise in processing wood.
[0010] The low voltage exploding method using a low voltage steam and the compressed air as other drug solution sinking-in approaches is performed (for example, reference, such as JP,5-237812,A and JP,6-39807,A). Although this approach tends to make a cell wall hole and the cell of the circumference of it cause small-scale destruction and tends to promote drying and impregnating ability by repeating the cooking processing which made the cooking conditions per time loose, and momentary atmospheric-air disconnection two or more times, and performing them, this art needs to repeat multiple times and processing, needs to perform them, and by the time it obtains the desired amount of sinking in, it will require time amount very much.
[0011] The purpose of this invention is to offer the new sinking-in approach which can cancel above un-arranging [which the sinking-in approach of the drug solutions to the conventional woody material has]. More specifically It is in offering the woody material manufactured by the sinking-in approach of the drug solutions to the woody material which can infiltrate the drug solution of more amounts etc. into homogeneity to the interior by the short processing time, without changing the dimension, and this sinking-in approach.
[0012]
[Means for Solving the Problem] Fundamentally, after the sinking-in approach of the drug solutions to the woody material by this invention for solving the above-mentioned technical problem performs heating steam treatment to woody material, it is characterized by infiltrating drug solutions into this woody material.
[0013] The heating steam treatment approach may be the approach of the already proposed arbitration. For example, the moisture which holds the woody material as processed material in the sealed space, heats woody material, and the woody material itself has is formed into a high-pressure steam. Or the approach of supplying a high-pressure steam from the outside, or carrying out predetermined time neglect of the woody material concerned with the both sides at the heating steam ambient atmosphere formed in seal space is effective.
[0014] Moreover, when supplying a high-pressure steam from the outside, it is effective to supply, after making the inside of the sealed space into a reduced pressure condition, and compaction of the processing time is achieved. The immersion sinking-in method, the hot-cold bath sinking-in method, the reduced pressure sinking-in method, the pressurization sinking-in method, or the sinking-in approach by those combination can be used for the method of infiltrating the drug solutions performed after that that what is necessary is just to use suitably the approach of the arbitration currently performed conventionally.
[0015] While processed wood quality material has high dimensional stability by performing the above heating steam treatment, it is destroyed on a small scale and cinclides and its circumference serve as a ******** ingredient until it results in the deep part. Therefore, as compared with the case where it gives unsettled woody material, the drug solution of the amount of many in the shorter processing time etc. sinks even into the interior of woody material easily and certainly at homogeneity by performing sinking-in processing of the drug solution by the conventional method etc. to woody material [finishing / this processing].
[0016] this invention -- setting -- the woody material as processed material -- especially -- a limit -- there is nothing -- the veneer, pure material, and ** -- it is independent about woody processing ingredients, such as an ingredient by which plate manufacturing was carried out from the natural tree [like], a plywood, a particle board, and MDF, OSB, -- it is -- it is the form of those composites and all can be used. Moreover, the water content of the processed material in the time of processing is also arbitrary. Furthermore, the thing of an air-drying condition may be used and you may be the woody material which performed stoving processing beforehand with heating means, such as high-frequency heating containing for example, a hot blast circuit system dryer, a jet dryer, an infrared (far-infrared-rays, near infrared ray) dryer, a heat press, or microwave, in order to gather processing effectiveness, and was made into water content lower than the water content by the natural condition.
[0017] Since in any case cinclides and its circumference are destroyed on a small scale by heating steam treatment and it becomes a ******** ingredient, sinking-in processing also of a difficulty permeability ingredient like pure material with much tar can be carried out efficiently. Moreover, since swelling does not produce the woody material which performed heating steam treatment by sinking-in processing of a subsequent drug solution etc. so that a postscript may be carried out, the art of this invention functions effectively also to the particle board for which drug solution sinking-in processing was conventionally difficult, and an ingredient like MDF and OSB by which compression molding was carried out.
[0018] Said sealed space may be the seal space by the proof-pressure mold pressurized container for woody

material processing conventionally used it is desirable and possible [supply of a heating steam] on condition that vacuum suction is preferably possible, and may be seal space formed between the heating plates with which the heating plate press conventionally used for pressing of woody material or manufacture of composite is equipped.
[0019] that in which said proof-pressure mold pressurized container or a heating plate press has a heat source, and the thing which it does not have -- although you may be any, especially the thing that has a heat source is recommended. The high-frequency heating which contains electric heating means, such as a heater built into the proof-pressure mold pressurized container or the heating plate press, heating steam, and a band heater, and microwave as a heat source is arbitration, said seal space is beforehand made a temperature up condition by this heat source, and the woody material as processed material is held there according to it. Temperature up temperature is the temperature requirement where the stabilization processing by the heating steam advances preferably, i.e., the range which is about 180 degrees C - about 220 degrees C. Heating is continued after holding the woody material which should be processed, and a heating steam is supplied in seal space if needed. Thereby, cinclides and its circumference are destroyed on a small scale, and the heating steam treatment of woody material serves as a ******** ingredient until it advances and results in stabilization and coincidence at a deep part.
[0020] When supplying a heating steam in seal space, a high-pressure steam, i.e., saturated steam, or superheated steam (steam of temperature higher than saturated steam) is made to blow off in the seal space made into the reduced pressure condition preferably. Although an optimum value is experimentally defined with a class, a dimension, etc. of the target wood quality [conditions / processing] material, number kgf/cm2 - 30 kgf/cm2, and temperature have [the pressure of a heating steam] 150 degrees C - desirable about 230 degrees C.
[0021] In are parallel and performing vacuum suction in seal space, in addition to the jet force, the heating steam to spout receives an operation of a suction force, and kinetic energy increases. Thereby, a heating steam penetrates certainly even to the interior or the deep part of woody material rather than a conventional method for a short time, and it spreads round homogeneity. Consequently, stabilization processing advances over the whole region promptly, and cinclides and small-scale destruction of the circumference of it also advance quickly over the whole region to coincidence.
[0022] The initial thickness of the woody material which should be processed in this invention may be the thing of the almost same thickness as the thickness of a desired final product, and may be thicker than it. In the case of the former, the so-called consolidation processing is not performed, but in the case of the latter, stabilization processing is performed with consolidation processing.
[0023] In addition, a well-known approach which is indicated by JP,6-238616,A, JP,8-108406,A, etc. can be conventionally used for the above-mentioned heating steam treatment suitably.
[0024] After performing heating steam treatment as mentioned above, with proper means, such as opening a decompression bulb, the inside of seal space is gently returned to ordinary pressure, processed material is taken out from the inside of seal space, and sinking-in processing of the drug solution by either of the conventional methods etc. is performed. The stage to perform sinking-in processing of a drug solution etc. may be arbitrary, may be immediately after heating steam treatment, and may be after fixed time amount progress after heating steam treatment. Preferably, it is immediately after heating steam treatment, and the temperature of woody material performs still more preferably 60 degrees C or more of ordinary pressure immersion processings only once for a short time (a second and part order) at the time of 100 degrees C or more. thus, the thing to do -- after heating steam treatment -- fixed time amount progress -- carrying out -- ordinary temperature -- the amount of sinking in equivalent to the time of performing reduced pressure sinking in etc. to the processed material which became near -- an easy way -- and it can obtain in a short time.
[0025] Moreover, although all the things that especially a limit does not have in the drug solution to be used, either, and are used for drug solution sinking-in processing of the conventional woody material can be used, since the cinclides of woody material and its circumference are destroyed by heating steam treatment and ****** at the time of being drug solution sinking in is secured, use uses drug solutions with the difficult big molecular weight convenient conventionally, and things are made.
[0026]
[Example] Hereafter, an example explains this invention.
[Example 1] The plain sawn timber of a Japan cedar with a dimension of 10x100x900mm is arranged in the proof-pressure container made from stainless steel with an inside dimension of 12x110x100mm beforehand warmed at 200 degrees C, and it is 15 kgf/cm2. Heating steam treatment by the high-pressure steam which carries out injection impregnation of the 200-degree C heating steam for 10 minutes was performed. Processing material was taken out after returning the steam in a container to ordinary pressure gently by the decompression bulb after processing for 10 minutes.
[0027] To this processing material, the unsaturated-polyester-resin solution (unsaturated polyester: styrene : BPO= 60:40:5-% of the weight ratio) was further returned to ordinary pressure with the manometric method for 1 hour, and it performed sinking in for 1 hour. Then, a hotpress is used and they are 130 degrees C and 5 kgf/cm2. Heating and pressurization were performed for 10 minutes on conditions, and resin was stiffened.

[0028] [Example 2] The same processing as an example 1 was performed to OSB with a dimension of 10x100x900mm.

[0029] [Example 1 of a comparison] The same processing as an example 1 was performed to the Japan cedar material (dimension of 10x100x900mm) which is not performing heating steam treatment.

[0030] [Example 2 of a comparison] The same processing as an example 1 was performed to OSB (dimension of 10x100x900mm) which is not performing heating steam treatment.

[0031] [Example 3] After performing steam treatment for 10 minutes like an example 1 to a Japan cedar plain sawn timber with a dimension of 10x100x900mm, it sank into the colloidal silica solution (30% as SiO2) within several seconds, and ordinary pressure immersion processing was performed for 1 minute. After taking out processing material out of the after [1 minute] solution and wiping off surface moisture lightly with a waste cloth, desiccation was performed in 80-degree-C oven for 48 hours.

[0032] [Example 3 of a comparison] The same processing as an example 3 was performed to the Japan cedar material (dimension of 10x100x900mm) which is not performing heating steam treatment.

[0033] [Evaluation trial] It asked for the weight rate of increase, grain direction rate of change (L rate of change), the radiation direction rate of change (R rate of change), and tangential direction rate of change (T rate of change) about example 1 and example of comparison 1 product. The result is shown in Table 1. Moreover, it asked for the weight rate of increase, vertical rate of change, horizontal rate of change, and a thickness change about the product of an example 2 and the example 2 of a comparison. The result is shown in Table 2. It asked for the weight rate of increase about example 3 and example of comparison 3 product. The result is shown in Table 3.

[0034] In addition, the weight rate of increase showed the weight change before and behind drug solution sinking in in all dry state, and calculated it as [(all-dry weight before the all-dry weight-drug solution processing after drug solution processing) all-dry weight before /drug solution processing] x100. Moreover, each rate of change showed the dimensional change before and behind drug solution sinking in in all dry state, and calculated it as [(dimension of ****** before dimension-drug solution processing of ****** after drug solution processing) dimension of ****** before /drug solution processing] x100.

[0035]

[Table 1] Processing to Japan cedar material (sink [unsaturated-polyester-resin solution] in)

	重量増加率	L変化率	R変化率	T変化率
実施例1	79.8	0.0	0.5	0.0
比較例1	42.0	0.1	0.9	0.3

[0036]

[Table 2] Processing to OSB (sink [unsaturated-polyester-resin solution] in)

	重量増加率	縦変化率	横変化率	厚変化率
実施例2	120.3	0.0	0.1	2.4
比較例2	82.6	0.1	0.3	24.3

[0037]

[Table 3] Processing to Japan cedar material (it is a colloidal silica solution within several seconds)

	重量増加率
実施例3	73.0
比較例3	7.0

[0038] [Consideration] Since the amount of drug solution sinking in in the same processing time improves greatly and the dimensional stability of processed material is already improved by performing processing by this invention as shown in Table 1 and Table 2, the swelling by drug solution sinking in is not produced in all the directions. Moreover, by the 1-minute room [about] ordinary pressure sinking-in method, the amount of sinking in which was not considered was able to be conventionally obtained from Table 3 by performing ordinary pressure sinking-in processing within several seconds after heating steam treatment.

[0039]

[Effect of the Invention] According to this invention, by performing heating steam treatment to processed wood quality material beforehand, it is destroyed on a small scale to a deep part, and the cinclides in woody material and its periphery function as ****** at the time of that being drug solution sinking in. Thereby, the compaction of increase and the sinking-in processing time of the wet out rate of a drug solution etc. is attained. Furthermore, since cinclides and its periphery can be passed even when the matter in a drug solution is larger than before (molecular weight is large), the width of face of selections, such as a drug solution, also spreads. Between coincidence, the amount of sinking in which was not obtained can be conventionally obtained only by performing

short-time ordinary pressure sinking-in processing within several seconds immediately after heating steam treatment especially.

[0040] Moreover, since dimensional stability is already given by heating steam treatment, even if it performs drug solution sinking in, woody material becomes possible [not starting swelling and performing sinking-in processing to a final product]. Therefore, the drug solution sinking-in processing as after treatment to the particle board which will be swollen if drug solution sinking-in processing is performed conventionally, and a board like MDF and OSB by which compression molding was carried out is attained. Moreover, since ****** of said drug solution functions effectively also at the time of the desiccation after sinking in, it can dry processed material in efficient and a short time.

[Translation done.]

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the woody material manufactured by the drug solution sinking-in approach and this approach at the time of infiltrating drug solutions into woody material for the purpose like the improvement in a mechanical strength, or fire retardancy and antiseptic grant which were improved.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Infiltrating the drug solutions like an unsaturated-polyester-resin solution or a colloidal silica solution from improvement in a mechanical strength or the purpose of fire retardancy and antiseptic grant is performed to woody processing ingredients (henceforth [these are named generically and] "woody material"), such as a veneer, a plate sawed up from a natural tree like pure material, or a plywood.
[0003] The immersion sinking-in method sinking in is immersed into a drug solution and usually infiltrates processed wood quality material, The hot-cold bath sinking-in method for having been made to carry out absorption sinking in of the drug solutions into this woody material by moving quickly into a cold drug solution (cold bath), and making it cool, after heating processed wood quality material in a warm drug solution (hot bath), The air in the wood used as the hindrance of sinking in is eliminated with reduced pressure, and it is carried out by the reduced pressure sinking-in method which made it easy to carry out to sink [of drug solutions] in, the pressurization sinking-in method for pushing in drug solutions compulsorily with external pressure, the pouring-in method which combined the above mentioned reduced pressure and pressurization further. Thus, as compared with woody material with the woody unsettled material into which drug solutions were poured into and it sank, improvement in a mechanical strength and an improvement of physical properties like fire retardancy and antiseptic one are brought about.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, by performing heating steam treatment to processed wood quality material beforehand, it is destroyed on a small scale to a deep part, and the cinclides in woody material and its periphery function as ****** at the time of that being drug solution sinking in. Thereby, the compaction of increase and the sinking-in processing time of the wet out rate of a drug solution etc. is attained. Furthermore, since cinclides and its periphery can be passed even when the matter in a drug solution is larger than before (molecular weight is large), the width of face of selections, such as a drug solution, also spreads. Between coincidence, the amount of sinking in which was not obtained can be conventionally obtained only by performing short-time ordinary pressure sinking-in processing within several seconds immediately after heating steam treatment especially.

[0040] Moreover, since dimensional stability is already given by heating steam treatment, even if it performs drug solution sinking in, woody material becomes possible [not starting swelling and performing sinking-in processing to a final product]. Therefore, the drug solution sinking-in processing as after treatment to the particle board which will be swollen if drug solution sinking-in processing is performed conventionally, and a board like MDF and OSB by which compression molding was carried out is attained. Moreover, since ****** of said drug solution functions effectively also at the time of the desiccation after sinking in, it can dry processed material in efficient and a short time.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] When carrying out sinking-in processing of the drug solution etc. to woody material, a drug solution etc. is fundamentally wanted to permeate the interior of woody material uniformly and so much in short time amount. however -- actual sinking-in processing -- the any -- although -- it is hard to say that it is attained as expected. In fact, even when it is water with comparatively easy osmosis into woody material, most time amount is required for permeating homogeneity even inside processed wood and reaching equilibrium. It is thought that the reason is difficult to permeate and becomes what has inadequate sinking in since the opening section inside wood is filled with air and a permutation with water is not usually performed easily. Water compares with the case of drug solutions, such as a resin solution, and osmosis becomes much more difficult the magnitude of the molecular weight, and for viscosity.

[0005] The drug solution which molecular weight uses using the high drug solution of permeability with viscosity low low again etc. in order to conquer these permeability is restricted, or as described above, using the reduced pressure sinking-in method, the pressurization sinking-in method, or the sinking-in method that reduced pressure and pressurization combined is performed. Depending on the case, long duration is required very much, and it is performing immersion sinking [of a drug solution] in. However, the present condition is being unable to obtain a desired sinking-in result, and effective processing by the short processing time is desired especially.

[0006] Moreover, cinclides are connecting between cells within woody material, and cinclides are usually blockaded by torus with the air dried material (about 12 - 14% of water content). Since the magnitude of the drug solution which can pass cinclides also in the condition of being open is restricted by spacing of the microfibril which forms MARUGO, even if it is going to sink in compulsorily by the above compulsory impregnation approaches, the drug solution more than the magnitude of cinclides cannot be passed. Therefore, the class of drug solution cannot but receive a limit.

[0007] since the swelling caused by sinking-in processing therefore happens to the condition of sinking in, or the condition of woody material at an ununiformity even if it is able to sink in well, or it cannot come out as it is, and it cannot treat as a final product but it saws up after sinking in after all -- polish and canna -- a finishing process like a cliff is needed. Moreover, generally, although near a cross section of wood shows good permeability, osmosis becomes difficult as it separates from a cross section of wood. Therefore, when sinking-in processing of a drug solution is made, it is not avoided that near a cross section of wood swells.

[0008] Especially, to an ingredient like PB (particle board), MDF (medium-density fiberboard), and OSB (Oriented Strand Board) by which compression molding was carried out, it expands greatly in the thickness direction at the time of drug solution sinking in, and does not return to the original thickness after desiccation.

[0009] Furthermore, in order to make a drug solution component fix within wood after sinking in, it is necessary to carry out desiccation processing, but also in the desiccation process, since it is hard to escape from moisture or a solvent, long time amount is needed for the process which stiffens the process which volatilizes a solvent, resin, etc. If it is going to carry out for a short time, moisture gradient will become large and curvature, a crack, etc. will arise in processing wood.

[0010] The low voltage exploding method using a low voltage steam and the compressed air as other drug solution sinking-in approaches is performed (for example, reference, such as JP,5-237812,A and JP,6-39807,A). Although this approach tends to make a cell wall hole and the cell of the circumference of it cause small-scale destruction and tends to promote drying and impregnating ability by repeating the cooking processing which made the cooking conditions per time loose, and momentary atmospheric-air disconnection two or more times, and performing them, this art needs to repeat multiple times and processing, needs to perform them, and by the time it obtains the desired amount of sinking in, it will require time amount very much.

[0011] The purpose of this invention is to offer the new sinking-in approach which can cancel above un-arranging [which the sinking-in approach of the drug solutions to the conventional woody material has]. More specifically It is in offering the woody material manufactured by the sinking-in approach of the drug solutions to the woody material which can infiltrate the drug solution of more amounts etc. into homogeneity to the interior by the short processing time, without changing the dimension, and this sinking-in approach.

MEANS

[Means for Solving the Problem] Fundamentally, after the sinking-in approach of the drug solutions to the woody material by this invention for solving the above-mentioned technical problem performs heating steam treatment to woody material, it is characterized by infiltrating drug solutions into this woody material.
[0013] The heating steam treatment approach may be the approach of the already proposed arbitration. For example, the moisture which holds the woody material as processed material in the sealed space, heats woody material, and the woody material itself has is formed into a high-pressure steam. Or the approach of supplying a high-pressure steam from the outside, or carrying out predetermined time neglect of the woody material concerned with the both sides at the heating steam ambient atmosphere formed in seal space is effective.
[0014] Moreover, when supplying a high-pressure steam from the outside, it is effective to supply, after making the inside of the sealed space into a reduced pressure condition, and compaction of the processing time is achieved. The immersion sinking-in method, the hot-cold bath sinking-in method, the reduced pressure sinking-in method, the pressurization sinking-in method, or the sinking-in approach by those combination can be used for the method of infiltrating the drug solutions performed after that that what is necessary is just to use suitably the approach of the arbitration currently performed conventionally.
[0015] While processed wood quality material has high dimensional stability by performing the above heating steam treatment, it is destroyed on a small scale and cinclides and its circumference serve as a ******** ingredient until it results in the deep part. Therefore, as compared with the case where it gives unsettled woody material, the drug solution of the amount of many in the shorter processing time etc. sinks even into the interior of woody material easily and certainly at homogeneity by performing sinking-in processing of the drug solution by the conventional method etc. to woody material [finishing / this processing].
[0016] this invention -- setting -- the woody material as processed material -- especially -- a limit -- there is nothing -- the veneer, pure material, and ** -- it is independent about woody processing ingredients, such as an ingredient by which plate manufacturing was carried out from the natural tree [like], a plywood, a particle board, and MDF, OSB, -- it is -- it is the form of those composites and all can be used. Moreover, the water content of the processed material in the time of processing is also arbitrary. Furthermore, the thing of an air-drying condition may be used and you may be the woody material which performed stoving processing beforehand with heating means, such as high-frequency heating containing for example, a hot blast circuit system dryer, a jet dryer, an infrared (far-infrared-rays, near infrared ray) dryer, a heat press, or microwave, in order to gather processing effectiveness, and was made into water content lower than the water content by the natural condition.
[0017] Since in any case cinclides and its circumference are destroyed on a small scale by heating steam treatment and it becomes a ******** ingredient, sinking-in processing also of a difficulty permeability ingredient like pure material with much tar can be carried out efficiently. Moreover, since swelling does not produce the woody material which performed heating steam treatment by sinking-in processing of a subsequent drug solution etc. so that a postscript may be carried out, the art of this invention functions effectively also to the particle board for which drug solution sinking-in processing was conventionally difficult, and an ingredient like MDF and OSB by which compression molding was carried out.
[0018] Said sealed space may be the seal space by the proof-pressure mold pressurized container for woody material processing conventionally used it is desirable and possible [supply of a heating steam] on condition that vacuum suction is preferably possible, and may be seal space formed between the heating plates with which the heating plate press conventionally used for pressing of woody material or manufacture of composite is equipped.
[0019] that in which said proof-pressure mold pressurized container or a heating plate press has a heat source, and the thing which it does not have -- although you may be any, especially the thing that has a heat source is recommended. The high-frequency heating which contains electric heating means, such as a heater built into the proof-pressure mold pressurized container or the heating plate press, heating steam, and a band heater, and microwave as a heat source is arbitration, said seal space is beforehand made a temperature up condition by this heat source, and the woody material as processed material is held there according to it. Temperature up temperature is the temperature requirement where the stabilization processing by the heating steam advances preferably, i.e., the range which is about 180 degrees C - about 220 degrees C. Heating is continued after holding

the woody material which should be processed, and a heating steam is supplied in seal space if needed. Thereby, cinclides and its circumference are destroyed on a small scale, and the heating steam treatment of woody material serves as a ******** ingredient until it advances and results in stabilization and coincidence at a deep part.

[0020] When supplying a heating steam in seal space, a high-pressure steam, i.e., saturated steam, or superheated steam (steam of temperature higher than saturated steam) is made to blow off in the seal space made into the reduced pressure condition preferably. Although an optimum value is experimentally defined with a class, a dimension, etc. of the target wood quality [conditions / processing] material, number kgf/cm2 - 30 kgf/cm2, and temperature have [the pressure of a heating steam] 150 degrees C - desirable about 230 degrees C.

[0021] In are parallel and performing vacuum suction in seal space, in addition to the jet force, the heating steam to spout receives an operation of a suction force, and kinetic energy increases. Thereby, a heating steam penetrates certainly even to the interior or the deep part of woody material rather than a conventional method for a short time, and it spreads round homogeneity. Consequently, stabilization processing advances over the whole region promptly, and cinclides and small-scale destruction of the circumference of it also advance quickly over the whole region to coincidence.

[0022] The initial thickness of the woody material which should be processed in this invention may be the thing of the almost same thickness as the thickness of a desired final product, and may be thicker than it. In the case of the former, the so-called consolidation processing is not performed, but in the case of the latter, stabilization processing is performed with consolidation processing.

[0023] In addition, a well-known approach which is indicated by JP,6-238616,A, JP,8-108406,A, etc. can be conventionally used for the above-mentioned heating steam treatment suitably.

[0024] After performing heating steam treatment as mentioned above, with proper means, such as opening a decompression bulb, the inside of seal space is gently returned to ordinary pressure, processed material is taken out from the inside of seal space, and sinking-in processing of the drug solution by either of the conventional methods etc. is performed. The stage to perform sinking-in processing of a drug solution etc. may be arbitrary, may be immediately after heating steam treatment, and may be after fixed time amount progress after heating steam treatment. Preferably, it is immediately after heating steam treatment, and the temperature of woody material performs still more preferably 60 degrees C or more of ordinary pressure immersion processings only once for a short time (a second and part order) at the time of 100 degrees C or more. thus, the thing to do -- after heating steam treatment -- fixed time amount progress -- carrying out -- ordinary temperature -- the amount of sinking in equivalent to the time of performing reduced pressure sinking in etc. to the processed material which became near -- an easy way -- and it can obtain in a short time.

[0025] Moreover, although all the things that especially a limit does not have in the drug solution to be used, either, and are used for drug solution sinking-in processing of the conventional woody material can be used, since the cinclides of woody material and its circumference are destroyed by heating steam treatment and ****** at the time of being drug solution sinking in is secured, use uses drug solutions with the difficult big molecular weight convenient conventionally, and things are made.

[Translation done.]

EXAMPLE

[Example] Hereafter, an example explains this invention.
[Example 1] The plain sawn timber of a Japan cedar with a dimension of 10x100x900mm is arranged in the proof-pressure container made from stainless steel with an inside dimension of 12x110x100mm beforehand warmed at 200 degrees C, and it is 15 kgf/cm2. Heating steam treatment by the high-pressure steam which carries out injection impregnation of the 200-degree C heating steam for 10 minutes was performed. Processing material was taken out after returning the steam in a container to ordinary pressure gently by the decompression bulb after processing for 10 minutes.
[0027] To this processing material, the unsaturated-polyester-resin solution (unsaturated polyester: styrene : BPO= 60:40:5-% of the weight ratio) was further returned to ordinary pressure with the manometric method for 1 hour, and it performed sinking in for 1 hour. Then, a hotpress is used and they are 130 degrees C and 5 kgf/cm2. Heating and pressurization were performed for 10 minutes on conditions, and resin was stiffened.
[0028] [Example 2] The same processing as an example 1 was performed to OSB with a dimension of 10x100x900mm.
[0029] [Example 1 of a comparison] The same processing as an example 1 was performed to the Japan cedar material (dimension of 10x100x900mm) which is not performing heating steam treatment.
[0030] [Example 2 of a comparison] The same processing as an example 1 was performed to OSB (dimension of 10x100x900mm) which is not performing heating steam treatment.
[0031] [Example 3] After performing steam treatment for 10 minutes like an example 1 to a Japan cedar plain sawn timber with a dimension of 10x100x900mm, it sank into the colloidal silica solution (30% as SiO2) within several seconds, and ordinary pressure immersion processing was performed for 1 minute. After taking out processing material out of the after [1 minute] solution and wiping off surface moisture lightly with a waste cloth, desiccation was performed in 80-degree-C oven for 48 hours.
[0032] [Example 3 of a comparison] The same processing as an example 3 was performed to the Japan cedar material (dimension of 10x100x900mm) which is not performing heating steam treatment.
[0033] [Evaluation trial] It asked for the weight rate of increase, grain direction rate of change (L rate of change), the radiation direction rate of change (R rate of change), and tangential direction rate of change (T rate of change) about example 1 and example of comparison 1 product. The result is shown in Table 1. Moreover, it asked for the weight rate of increase, vertical rate of change, horizontal rate of change, and a thickness change about the product of an example 2 and the example 2 of a comparison. The result is shown in Table 2. It asked for the weight rate of increase about example 3 and example of comparison 3 product. The result is shown in Table 3.
[0034] In addition, the weight rate of increase showed the weight change before and behind drug solution sinking in in all dry state, and calculated it as [(all-dry weight before the all-dry weight-drug solution processing after drug solution processing) all-dry weight before /drug solution processing] x100. Moreover, each rate of change showed the dimensional change before and behind drug solution sinking in in all dry state, and calculated it as [(dimension of ****** before dimension-drug solution processing of ****** after drug solution processing) dimension of ****** before /drug solution processing] x100.
[0035]
[Table 1] Processing to Japan cedar material (sink [unsaturated-polyester-resin solution] in)

	重量増加率	L変化率	R変化率	T変化率
実施例1	79.8	0.0	0.5	0.0
比較例1	42.0	0.1	0.9	0.3

[0036]
[Table 2] Processing to OSB (sink [unsaturated-polyester-resin solution] in)

	重量増加率	縦変化率	横変化率	厚変化率
実施例2	120.3	0.0	0.1	2.4
比較例2	82.6	0.1	0.3	24.3

[0037]

[Table 3] Processing to Japan cedar material (it is a colloidal silica solution within several seconds)

	重量増加率
実施例3	73.0
比較例3	7.0

[0038] [Consideration] Since the amount of drug solution sinking in in the same processing time improves greatly and the dimensional stability of processed material is already improved by performing processing by this invention as shown in Table 1 and Table 2, the swelling by drug solution sinking in is not produced in all the directions. Moreover, by the 1-minute room [about] ordinary pressure sinking-in method, the amount of sinking in which was not considered was able to be conventionally obtained from Table 3 by performing ordinary pressure sinking-in processing within several seconds after heating steam treatment.

[Translation done.]

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(54)【発明の名称】　木質材への薬液類の含浸方法及び該方法により製造された木質材

(57)【要約】
【課題】　木質材に短時間で多量の薬液を均一に含浸させるための処理方法を得る。
【解決手段】　密閉された空間内に処理すべき木質材を収容し、該木質材を加熱して木質材そのものが有する水分を加熱水蒸気化し、さらに、必要に応じて加熱水蒸気を外部から供給して、該木質材に対して加熱水蒸気処理を施し、加熱水蒸気処理が施された木質材に対して従来法による薬液類の含浸処理を行う。

【特許請求の範囲】
【請求項１】　木質材に加熱水蒸気処理を施した後に、該木質材に薬液類を含浸することを特徴とする木質材への薬液類含浸方法。
【請求項２】　密閉された空間内に木質材を収容し、木質材を加熱して及び／又は高圧水蒸気を外部から供給して、収容した木質材そのものが有する水分を高圧水蒸気化して当該木質材に加熱水蒸気処理を施し、該加熱水蒸気処理を施した木質材に対して薬液類を含浸することを特徴とする木質材への薬液類含浸方法。
【請求項３】　密閉された空間内に収容する木質材として、加熱乾燥処理を予め施して自然状態による含水率より低い含水率とした木質材を用いることを特徴とする請求項２記載の木質材への薬液類含浸方法。
【請求項４】　密閉された空間内を減圧状態とした後に、高圧水蒸気を外部から供給して当該木質材に対して加熱水蒸気処理を施すことを特徴とする請求項２又は３記載の木質材への薬液類含浸方法。
【請求項５】　薬液類の含浸方法が、浸漬含浸法、温冷浴含浸法、減圧含浸法、加圧含浸法、又は、それらの組合せによる含浸方法であることを特徴とする請求項１ないし４いずれか記載の木質材への薬液類含浸方法。
【請求項６】　木質材に加熱水蒸気処理を施した後、該木質材の温度が６０℃以上の状態で、常圧下浸漬含浸法による薬液類の含浸を行うことを特徴とする請求項１ないし４いずれか記載の木質材への薬液類含浸方法。
【請求項７】　請求項１ないし６いずれか記載の方法により製造された薬液類含浸木質材。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、機械的強度向上や難燃性・防腐性の付与のような目的で木質材に薬液類を含浸させる際の、改良された薬液類含浸方法及び該方法により製造された木質材に関する。
【０００２】
【従来の技術】単板、無垢材のような自然木から製材された板材、あるいは、合板等の木質加工材料（以下、これらを総称して「木質材」という）に対し、機械的強度の向上や難燃性・防腐性の付与の目的から、不飽和ポリエステル樹脂溶液やコロイダルシリカ溶液のような薬液類を含浸させることが行われる。
【０００３】含浸は、通常、被処理木質材を薬液中に浸漬して含浸させる浸漬含浸法、被処理木質材を温かい薬液（温浴）中で加熱した後、冷たい薬液中（冷浴）に急速に移して冷却させることにより該木質材中に薬液類を吸収含浸させるようにした温冷浴含浸法、含浸の妨げとなっている木材中の空気を減圧によって排除して薬液類の含浸をし易くした減圧含浸法、外圧によって薬液類を強制的に押し込める加圧含浸法、さらには、前記した減圧と加圧を組み合わせた注入法、等により行われる。このようにして薬液類が注入、含浸された木質材は、未処理の木質材と比較して、機械的強度の向上や難燃性・防腐性のような物性の改善がもたらされる。
【０００４】
【発明が解決しようとする課題】木質材へ薬液等を含浸処理する場合、薬液等が短い時間で木質材内部に均一にかつ多量に浸透することが基本的に望まれる。しかし、現実の含浸処理では、そのいずれもが所期どおりに達成されているとは言いがたい。事実、比較的木質材中への浸透が容易な水の場合でも、被処理木材の内部にまで均一に浸透し平衡状態に到達するにはかなりの時間を要する。その理由は、通常、木材内部の空隙部には空気が充満しており、水との置換が容易に行われないため、浸透が困難で含浸が不十分なものとなると考えられる。樹脂溶液等の薬液類の場合には、水の比較してその分子量の大きさや粘性のために、浸透は一層困難となる。
【０００５】これらの浸透性を克服するために、例えば、分子量が低くまた粘度の低い浸透性の高い薬液を用いる等、使用する薬液を制限したり、前記したように、減圧含浸法、加圧含浸法、もしくは減圧と加圧の組み合わせた含浸法、等を用いることが行われる。場合によっては、非常に長時間を要して薬液の浸漬含浸を行っている。しかしながら、所望の含浸結果を得ることができないのが現状であり、特に、短い処理時間での有効処理が望まれている。
【０００６】また、木質材内で細胞間を連絡しているのは壁孔であり、通常、気乾材（含水率１２～１４％程度）では壁孔はトールスによって閉塞している。開いている状態でも、壁孔を通過できる薬液の大きさはマルゴを形成するミクロフィブリルの間隔によって制限されるために、前記のような強制的注入方法で強制的に含浸しようとしても、壁孔の大きさ以上の薬液は通過できない。そのために、薬液の種類は制限を受けざるを得ない。
【０００７】うまく含浸できたとしても、含浸処理により引き起こされる膨潤が、含浸の状態や木質材の状態によって不均一に起こるため、そのままで最終製品として扱うことはできず、結局、含浸後に製材を行うか、研磨やかんながけのような仕上げ工程が必要となる。また、一般に、木口付近は良好な浸透性を示すものの、木口から離れるに従い浸透が困難になっていく。そのために、薬液の含浸処理がなされた場合に、木口付近だけが膨潤してしまうことが避けられない。
【０００８】特に、ＰＢ（パーチクルボード）、ＭＤＦ（中質繊維板）、ＯＳＢ（配向性ストランドボード）のような圧縮成形された材料に対しては、薬液含浸時に厚さ方向に大きく膨張し、乾燥後に元の厚さに戻らない。
【０００９】さらに、含浸後に薬液成分を木材内で固着させるために乾燥処理をすることが必要となるが、乾燥過程においても、水分又は溶媒が抜けにくいために、溶

媒を揮発させる工程や樹脂等を硬化させる工程に長い時間を必要としている。短時間で行おうとすると水分傾斜が大きくなり、処理木材に反りや割れ等が生じる。

【００１０】他の薬液含浸処理法として、低圧水蒸気や圧縮空気を用いた低圧爆砕法が行われる（例えば、特開平５－２３７８１２号公報、特開平６－３９８０７号公報等参照）。この方法は、一回当たりの蒸煮条件を緩くした蒸煮処理と瞬時の大気開放とを複数回繰り返し行うことにより、細胞壁孔やその周辺の細胞に小規模の破壊を起こさせ、乾燥性及び含浸性を促進しようとするものであるが、この処理方法は、複数回、処理を反復して行う必要があり、所望の含浸量を得るまでに非常に時間がかかってしまう。

【００１１】本発明の目的は、従来の木質材への薬液類の含浸方法が持つ上記のような不都合を解消することのできる新規な含浸方法を提供することにあり、より具体的には、短い処理時間で、より多くの量の薬液等を、その寸法を変えることなく、内部まで均一に含浸させることのできる木質材への薬液類の含浸方法、及び、該含浸方法により製造された木質材を提供することにある。

【００１２】

【課題を解決するための手段】上記の課題を解決するための本発明による木質材への薬液類の含浸方法は、基本的に、木質材に加熱水蒸気処理を施した後に、該木質材に薬液類を含浸させることを特徴とする。

【００１３】加熱水蒸気処理方法はすでに提案されている任意の方法であってよく、例えば、密閉された空間内に被処理材としての木質材を収容し、木質材を加熱して木質材自身が持つ水分を高圧水蒸気化し、又は、高圧水蒸気を外部から供給し、あるいはその双方により、当該木質材を密封空間内に形成された加熱水蒸気雰囲気に所定時間放置しておく方法は有効である。

【００１４】また、高圧水蒸気を外部から供給する場合に、密閉された空間内を減圧状態とした後に供給を行うことは効果的であり、処理時間の短縮が図られる。その後に行う薬液類を含浸させる方法は、従来行われている任意の方法を適宜用いればよく、浸漬含浸法、温冷浴含浸法、減圧含浸法、加圧含浸法、又は、それらの組合せによる含浸方法、等を利用できる。

【００１５】前記のような加熱水蒸気処理を施すことにより、被処理木質材は高い寸法安定性を持つようになると同時に、その深部にいたるまで壁孔及びその周辺が小規模に破壊され、易浸透性材料となる。そのために、該処理済みの木質材に対して従来法による薬液等の含浸処理を施すことによって、未処理の木質材に施す場合と比較して、より短い処理時間でより多くの量の薬液等が木質材の内部にまで均一に容易にかつ確実に含浸する。

【００１６】本発明において、被処理材としての木質材に特に制限はなく、単板、無垢材、のような自然木から製板された材料、合板、パーチクルボード、ＭＤＦ、ＯＳＢ等のような木質加工材料を、単独であるいはそれらの複合材の形で、すべて用いうる。また、処理時での被処理材の含水率も任意である。さらに、自然乾燥状態のものでもよく、処理効率を上げる目的で、予め、例えば熱風循環式ドライヤー、ジェットドライヤー、赤外線（遠赤外線、近赤外線）ドライヤー、熱プレス、あるいはマイクロウェーブを含む高周波加熱等の加熱手段によって加熱乾燥処理を施し、自然状態による含水率より低い含水率とした木質材であってもよい。

【００１７】いずれの場合も、加熱水蒸気処理により壁孔及びその周辺が小規模に破壊されて易浸透性材料となることから、ヤニの多い無垢材のような難浸透性材料も効率よく含浸処理することができる。また、後記するように、加熱水蒸気処理を施した木質材は、その後の薬液等の含浸処理によって膨潤が生じないことから、従来薬液含浸処理が困難であった、パーチクルボード、ＭＤＦ、ＯＳＢのような圧縮成形された材料に対しても本発明の処理方法は有効に機能する。

【００１８】前記密閉された空間は、好ましくは加熱水蒸気の供給が可能であり、また、さらに好ましくは真空引きが可能であることを条件に、従来用いられている木質材処理用の耐圧型圧力容器による密封空間であってもよく、また、木質材の圧締や複合材の製造に従来用いられる熱盤プレスに装着される熱盤の間に形成される密封空間であってもよい。

【００１９】前記耐圧型圧力容器又は熱盤プレスは、熱源を有するもの、有しないもののいずれであってもよいが、熱源を有するものが特に推奨される。熱源としては、耐圧型圧力容器あるいは熱盤プレスに組み込まれたヒーター、加熱蒸気、バンドヒーター等の電気的加熱手段、マイクロウェーブを含む高周波加熱、等任意であり、該熱源によって前記密封空間は予め昇温状態とされ、そこに、被処理材としての木質材が収容される。昇温温度は、好ましくは加熱水蒸気による寸法安定化処理が進行する温度範囲、すなわち、約１８０℃～２２０℃程度の範囲である。処理すべき木質材を収容後、加熱を継続し、必要に応じて、密封空間内に加熱水蒸気を供給する。それにより、木質材の加熱水蒸気処理は進行し、寸法安定化と同時に、深部にいたるまで壁孔及びその周辺が小規模に破壊され、易浸透性材料となる。

【００２０】加熱水蒸気を密封空間内に供給する場合は、高圧水蒸気、すなわち、飽和水蒸気又は過熱水蒸気（飽和水蒸気より高い温度の水蒸気）を、好ましくは、減圧状態とされた密封空間内に噴出させる。処理条件は対象となる木質材の種類及び寸法等によって実験的に最適値が定められるが、加熱水蒸気の圧力は数ｋｇｆ／ｃｍ^2～３０ｋｇｆ／ｃｍ^2、温度は１５０℃～２３０℃程度が好ましい。

【００２１】密封空間内の真空引きを平行して行う場合には、噴出する加熱水蒸気は、噴出力に加えて吸引力の

作用を受け、運動エネルギーが増大する。それにより、従来法よりも短時間で木質材の内部若しくは深部にまで加熱水蒸気が確実に透過し、かつ均一に行き渡る。その結果、寸法安定化処理が速やかにかつ全域にわたり進行し、同時に壁孔及びその周辺の小規模破壊も全域にわたり迅速に進行する。

【００２２】本発明において処理すべき木質材の初期厚さは、所望の最終製品の厚さとほぼ同じ厚さのものであってもよく、それよりも厚いものであってもよい。前者の場合はいわゆる圧密処理は施されないが、後者の場合は圧密処理と共に寸法安定化処理が施される。

【００２３】なお、上記の加熱水蒸気処理は、例えば、特開平６－２３８６１６号公報、特開平８－１０８４０６号公報等に記載されるような従来公知の方法を適宜用いることができる。

【００２４】上記のようにして加熱水蒸気処理を施した後、解圧バルブを開ける等の適宜の手段により、密封空間内を緩やかに常圧に戻し、密封空間内から被処理材を取り出し、従来法のいずれかによる薬液等の含浸処理を施す。薬液等の含浸処理を施す時期は任意であり、加熱水蒸気処理直後であってもよく、加熱水蒸気処理後に一定時間経過後にあってもよい。好ましくは、加熱水蒸気処理直後であって木質材の温度が６０℃以上、さらに好ましくは１００℃以上のときに、常圧浸漬処理を短時間（秒・分オーダー）で一回だけ行う。このようにすることにより、加熱水蒸気処理後に一定時間経過し常温近くなった被処理材に減圧含浸等を行ったときと同等の含浸量を容易なやり方でかつ短時間で得ることができる。

【００２５】また、使用する薬液にも特に制限はなく、従来の木質材の薬液含浸処理に用いているものをすべて用いうるが、加熱水蒸気処理によって木質材の壁孔やその周辺が破壊され、薬液含浸の際の通導口が確保されることから、従来使用が困難であった分子量の大きな薬液類も支障なく用いことができる。

【００２６】

【実施例】以下、実施例により本発明を説明する。

〔実施例１〕前もって２００℃に温めておいた内寸１２×１１０×１００mmのステンレス製耐圧容器内に、寸法１０×１００×９００mmのスギの板目材を配置させて、１５kgf／cm² で２００℃の加熱水蒸気を１０分間噴射注入する高圧水蒸気による加熱水蒸気処理を行った。１０分間処理後に容器内蒸気を解圧バルブで緩やかに常圧に戻した後、処理材を取り出した。

【００２７】該処理材に対し、不飽和ポリエステル樹脂溶液（不飽和ポリエステル：スチレン：ＢＰＯ＝６０：４０：５重量％比）を減圧法で1時間、さらに、常圧に戻して1時間含浸を行った。その後、ホットプレスを用いて１３０℃、５kgf／cm² の条件で１０分間加熱・加圧を行い、樹脂を硬化させた。

【００２８】〔実施例２〕寸法１０×１００×９００mmのＯＳＢに対して実施例１と同様の処理を行った。

【００２９】〔比較例１〕加熱水蒸気処理を行っていないスギ材（寸法１０×１００×９００mm）に対し、実施例１と同様の処理を行った。

【００３０】〔比較例２〕加熱水蒸気処理を行っていないＯＳＢ（寸法１０×１００×９００mm）に対し、実施例１と同様の処理を行った。

【００３１】〔実施例３〕寸法１０×１００×９００mmのスギ板目材に対して実施例１と同様に１０分間の水蒸気処理を行った後、数秒以内にコロイダルシリカ溶液（SiO_2 として３０％）に浸め１分間常圧浸漬処理を行った。１分後溶液中より処理材を取り出し表面の水分をウエスで軽く拭き取った後、８０℃乾燥器中で４８時間乾燥を行った。

【００３２】〔比較例３〕加熱水蒸気処理を行っていないスギ材（寸法１０×１００×９００mm）に対し、実施例３と同様の処理を行った。

【００３３】〔評価試験〕実施例１及び比較例１製品について、重量増加率、繊維方向変化率（Ｌ変化率）、放射方向変化率（Ｒ変化率）、及び、接線方向変化率（Ｔ変化率）を求めた。その結果を表１に示す。また、実施例２と比較例２の製品については、重量増加率、縦変化率、横変化率、及び、厚さ変化率を求めた。その結果を表２に示す。実施例３及び比較例３製品について、重量増加率を求めた。その結果を表３に示す。

【００３４】なお、重量増加率は全乾状態における薬液含浸前後の重量変化を示し、〔（薬液処理後の全乾重量－薬液処理前の全乾重量）／薬液処理前の全乾重量〕×１００として計算した。また、それぞれの変化率は全乾状態における薬液含浸前後の寸法変化を示し、〔（薬液処理後の全乾時の寸法－薬液処理前の全乾時の寸法）／薬液処理前の全乾時の寸法〕×１００として計算した。

【００３５】

【表１】スギ材に対する処理（不飽和ポリエステル樹脂溶液含浸）

	重量増加率	Ｌ変化率	Ｒ変化率	Ｔ変化率
実施例1	７９．８	０．０	０．５	０．０
比較例1	４２．０	０．１	０．９	０．３

【００３６】

【表２】ＯＳＢに対する処理（不飽和ポリエステル樹脂溶液含浸）

	重量増加率	縦変化率	横変化率	厚変化率
実施例2	１２０．３	０．０	０．１	２．４
比較例2	８２．６	０．１	０．３	２４．３

【００３７】

【表３】スギ材に対する処理（数秒以内にコロイダルシ

リカ溶液）

	重量増加率
実施例３	７３．０
比較例３	７．０

【００３８】〔考察〕表１、表２からわかるように、本発明による処理を行うことにより、同じ処理時間での薬液含浸量が大きく向上し、また、被処理材の寸法安定性がすでに改善されていることから、薬液含浸による膨潤は全方向において生じない。また、表３から、加熱水蒸気処理後、数秒以内に常圧含浸処理を行うことにより、従来１分間程度の常圧含浸法では考えられなかった含浸量を得ることができた。

【００３９】

【発明の効果】本発明によれば、被処理木質材にあらかじめ加熱水蒸気処理を行うことによって、木質材内の壁孔及びその周辺部は深部まで小規模に破壊され、そこが薬液含浸の際の通導口として機能する。それにより、薬液等の含浸速度が増し、含浸処理時間の短縮が可能となる。さらに、薬液中の物質が従来より大きい（分子量が大きい）ものの場合でも壁孔及びその周辺部を通過できることから、薬液等の選択の幅も広がる。特に、加熱水蒸気処理直後の数秒以内に短時間の常圧含浸処理を行うだけで、従来同時間では得られなかったような含浸量を得ることができる。

【００４０】また加熱水蒸気処理で寸法安定性がすでに付与されているため、薬液含浸を行っても木質材は膨潤を起こすことはなく、最終製品に含浸処理を行うことが可能となる。そのために、従来薬液含浸処理を行うと膨潤してしまうパーチクルボード、ＭＤＦ、ＯＳＢのような圧縮成形されたボードへの後処理としての薬液含浸処理が可能となる。また、前記薬液の通導口は、含浸後の乾燥時にも有効に機能することから、被処理材の乾燥を効率的かつ短時間で行うことができる。